

USER MANUAL

RA00277

**BRUSHLESS COMPETITION SPEED
IFMAR WORLD CHAMPION 2008/2009**

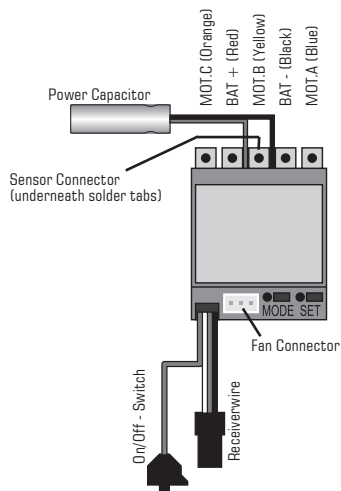
**#90900: >4.0T MOTORLIMIT
#90950: >2.5T MOTORLIMIT**

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for distributor address see packaging

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1. CONNECTIONS & EXPLANATIONS



RECEIVER CONNECTING WIRE: The Pearl is equipped with an NOSRAM Multicon receiver wire. As supplied, it will easily fit in all ordinary receivers. Make sure you connect it to receiver with correct polarity and use channel 2.

SENSOR CONNECTOR: located underneath the solder tabs. The bi-directional multipole sensor wire connects the speed-control and the motor. Always use the sensor wire and do not alter or modify this cable! There are replaceable/optional hall sensor wires available, please refer to complete line-up under point 6 „Spare- & Optional-Parts“.

POWER WIRES: For maximum performance, flexible silicone power wires without any connectors are used. The unique splitted solder-tabs allow easy and convenient replacement of the power wires. Nevertheless some soldering skills are required. Avoid soldering longer than 5sec per soldering joint to prevent possible damage to the speed-control due to overheating of the components! There are full replacement power wire sets available, please refer to complete line-up under point 6 „Spare- and Optional-Parts“.

HEATSINK: To achieve best performance even under extreme conditions, the heatsink has been directly mounted to the speed-control. This ensures the best possible heat transfer away from the speed-control.

Caution: Never attempt to remove the heatsink or your Pearl may get damaged if you try to do this. The heatsink is an integral part, glued to the fet's and therefore cannot be removed.

PLUGGED FAN (Pearl ISTC #90950 only!): your speed-control contains a high-performance low-profile (25x25x7mm) fan and blue anodised aluminium screws. the fan can be mounted on top of the heatsink and should be used for tough applications in hot conditions such as TC Modified or 4wd OffRoad. As a guideline we recommend using the fan with motors lower than 5.0T. The fan get's plugged into the 3-pin connector on the front and there is a replacement fan set available, please refer to complete line-up under point 6 „Spare- and Optional-Parts“.

On Pearl evolution (#90900) version you can also connect the optional fan to the same „port“ if needed.

2. INSTALLATION TIPS

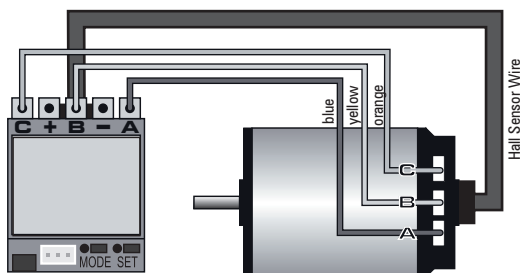
- Position the speed-control and capacitor where they are protected in the event of a crash and gives you easy access to the connectors and buttons.
- Mount the speedo and capacitor using the supplied thick/black doubled-sided tape
- Make sure there is enough clearance between the speed-control, power-wires, antenna and receiver. Avoid any direct contact between power components, the receiver or the antenna as this can cause interference. If interference occurs, position the components at a different place in the model.
- The aerial should be run vertically up and away from the receiver. Avoid contact with any parts made of carbon fibre or metal. If the aerial is too long, don't coil up the excess length. See also the instructions supplied with your radio control system.
- Because of the physical principles of brushless technology, the speed-controls do get a little hotter than brushed systems. Therefore it is required to let the speed-control cool down completely after every run.

3. WIRES & INSTALLATION

The Pearl's come supplied with flexible silicone power-wires (#90900 = 2.6mm² / #90950 = 3.3mm²) without connectors. Be very careful with the correct wire sequence/colors since an incorrect connection may damage the speed-control! Avoid creating solder bridges on the solder-tabs and isolate all connections carefully.

Caution: Avoid soldering longer than 5sec per soldering joint when replacing the power wires on the speed-control and motor to prevent possible damage due to overheating of the components!

- Connect the speed-control to the receiver (position: Channel 2)
- Blue power-wire → Speedo MOT.A to motor „A“
- Yellow power-wire → Speedo MOT.B to motor „B“
- Orange power-wire → Speedo MOT.C to motor „C“
- Connect the hall sensor cable to the speed-control (underneath the solder-tabs) and the motor.



- Doublecheck all connections before connecting the speed-control to a battery.
- CAUTION:** If battery is connected with reversed polarity it will destroy your speed-control!
- Red power-wire → Speedo BAT+ to battery „Plus“
- Black power-wire → Speedo BAT- to battery „Minus“
- The speed-control is now ready to be set-up (see section 5).

Dear Customer,

thank you for your trust in this NOSRAM product. By purchasing a **NOSRAM Pearl Evolution / Pearl ISTC** brushless speed-control, you have chosen one of the most advanced and successful speed-controls of today. This speed-control with all of its high-tech features and specially selected electronic components is one of the best speed-controls currently available on the market. IFMAR World Champion 2008/2009!

- Pure Brushless Competition Speed-Control
- Full Contact Cooling Technology
- All New Brake Design
- Smart-Temp-Readout System 2
- Launch Control
- Small footprint
- XPS.3 Software
- SmartCell System
- 4, 5, and 6 cell optimised
- Sensored Design

Please read the following instructions carefully before you start using your speed control. This user guide contains important notes for the safety, the use and the maintenance of this product. Thus protecting yourself and avoid damages of the product.

Proceed according to the user guide in order to understand your speed control better. Please take your time as you will have much more joy with your product if you know it exactly.

This user manual shall be kept in a safe place. If another customer is using this product, this manual has to be handed out together with it.

4. SPECIFICATIONS

	#90900	#90950
Pure Brushless Competition	yes	
Forward/Brake	yes	
Footprint	30.5x34.0mm	
Height	16.0mm	21.0mm
Weight (excl. wires)	30.0g	36.0g
Voltage Input	4.8-7.4V	
Typ. Voltage Drop* @20A	0.013V / phase	
Rated Current*	764A / phase	
Compatible winding styles	Star	
Rec. Motor Limit with 5 cells	over 4.0T	over 2.5T
Rec. Motor Limit with 6 cells	over 4.5T	over 3.0T
Power Wires	2.6mm ²	3.3mm ²
Plugged Fan	no	yes

	#90900	#90950
B.E.C.		6.0V/3.0A
Full Contact Cooling Technology	yes	
All New Brake Design	yes	
High Frequency	yes	
Sensored Brushless System	yes	
3-Way-Protection-System	yes	
4, 5, 6 cell optimised	yes	
Smart-Temp-Readout System 2	yes	
Launch Control	yes	
Blue LED		yes
4 adj. Modes (SmartCell System, XPS.3 Power Profiles, Initial- and Automatic-Brake)		yes

* Transistors ratings at 25°C junction temperature

Specifications subject to change without notice.

5. RADIO / SPEEDO SETUP

In setup mode the Pearl's stores every step (e.g. learning your radios neutral and endpoints) when you press the SET button. All the settings will be stored in the **Pearl's** memory even if it will be disconnected from the battery.

TRANSMITTER SETTINGS

Setup the following basic functions on your transmitter (if available):

Description	other names in radio	Required Setting
Throttle Travel	High ATV, EPA	100%
Brake Travel	Low ATV, EPA, ATL	100%
Throttle Exponential	EXP, EXP0	start with 0
Neutral Trim	SUB Trim	centre
Servo Reverse	Throttle Reverse	any setting, don't change after set-up procedure!

If your transmitter doesn't offer any of above functions, it's already in „basic setup“ mode.

- Ensure that the speed-control is not connected to the drive battery and is switched off.
- Remove motor pinion or ensure that the wheels of the model are free to rotate.
- Switch the transmitter on and set the transmitter throttle stick to neutral.

- Connect the speed-control to the battery and switch the unit on.
- Hold the SET button pressed for at least 3sec.
→ You entered setup mode and the SET LED flashes blue (it will flash until the setup is completed).

- Leave transmitter in neutral position and press the SET button once.
→ Neutral setting is stored, MODE LED flashes yellow and the motor beeps.
- Hold full throttle on transmitter and press the SET button once.
→ Full-throttle setting is stored, MODE LED flashes red.
- Hold full brake on transmitter and press the SET button once.
→ Brake setting is stored, LED's glow red (MODE) and blue (SET).

- This completes the setup procedure and your Pearl is ready to use.
- If you make a mistake during the setup procedure, don't worry: Disconnect the battery for about 10sec and start again from the first step.
- At the end of each run switch of the car, and then switch off the transmitter.
- At the start of each run switch on the transmitter first, then switch on the car.
- For storage of the car, disconnect the drive battery at any time!

CHECKING THE FUNCTIONS:

Check the LED's when moving your throttle stick and you will see if everything is setup correctly.

FUNCTION	STATUS	MODE LED	SET LED
Neutral (automatic brake inactive)	--	off	blue
Neutral (automatic brake active)	--	red	off
Forward	partial throttle	yellow	off
Forward	full throttle	yellow	blue
Brake	partial brake	red	off
Brake	full brake	red	blue

6. SPARE- & OPTIONAL PARTS

NOSRAM offers a comprehensive line of accessories, as well as particular spare- and optional items. Here you find an overview, for a full picture please visit our website at www.NOSRAM.com:

Spare parts:

- #92520 Sensor-Wire 200mm
- #92505 Power-Wire Set Brushless 2.6mm² (red, black, blue, orange, yellow)
- #92506 Power-Wire Set Brushless 3.3mm² (red, black, blue, orange, yellow)
- #92511 Low Profile cooling fan (only for 90950 speedo)

Optional parts:

- #925307 Sensor-Wire „HighFlex“ 70mm
- #925310 Sensor-Wire „HighFlex“ 100mm
- #925315 Sensor-Wire „HighFlex“ 150mm
- #925320 Sensor-Wire „HighFlex“ 200mm
- #92507 3.3mm² Powerwire black (1.0m)
- #92508 3.3mm² Powerwire red (1.0m)

7. MODE PROGRAMMING

The Pearl features 4 modes which enable you to adjust it 100% to YOUR special requirements. The factory settings are shown in grey colour.

- How to get into „programming the modes“ → Press MODE button for 3 or more seconds.
- How to check the stored values → Count the number of flashes of the blue SET-LED (2 = value 1 | 5 = value 2 | etc.).
- How to change the value → Press SET button to increase value by one step.
- How to get to the next Mode → Press MODE button once.
- How to leave the programming mode → If you are in MODE 4, press the MODE button one more time, which will also store the settings!

Important: do not turn the switch off before leaving Mode 4 (by one more press of MODE button) as otherwise your recent changes won't be stored in the memory of the Pearl!

Table of settings, values and modes: see below (grey-shaded values show „works default settings“)

MODE.1 (SmartCell System): we recommend using value #2 for 4-6 cells NiMH racing purposes, which disengages the LiPo protection.

MODE LED	#1	#2
Yellow	LiPo/NiMH Automatic	4-6cell NiMH Racing Mode

Caution: the by far most common reason for false shutdowns is using the wrong value in this mode!

MODE.2 (XPS.3™ Power Profiles): allows you to adjust the Pearl to your likes. Either you run OnRoad or OffRoad, on slippery or high-traction surfaces, we have incorporated a profile for you! Higher value means more overall power and more aggressive throttle response.

MODE LED	Remark	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10
Red	Limiter Throttle Timinglevel	low -expo 1	medium -expo 1	high -expo 1	off -expo 1	off -expo 2	off -expo 3	off linear 3	off linear 4	off +expo 4	off +expo 5

MODE.3 (Initial Brake): Allows you to set a certain level of „hand-brake-effect“, which is especially useful for OffRoad racing.

MODE LED	#0	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10
Yellow/Red (alternate)	none										

Going from lowest to highest initial brake setting (value 1 = minimum / value 10 = maximum)

MODE.4 (Automatic Brake): allows you to set a slight braking action which is applied in the neutral range. This enables you to simulate the feel of a brushed motor and also hold the throttle on longer when entering a turn. For brushless motors you achieve the same natural slowdown as a brushed motor with no autobrake when you set value 1-2.

MODE LED	#0	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10
Yellow/Red (same time)	none										

Going from lowest to highest automatic brake setting (value 1 = minimum / value 10 = maximum)

9. TROUBLESHOOTING GUIDE

To eliminate all other possibilities or improper handling, first check all other components in your model and the trouble shooting guide before you send in this product for repair. If products are sent in for repair, which do operate perfectly, we have to charge a service fee according to our pricelist.

SYMPTOM	CAUSE	REMEDY
Servo is working, no motor function.	Speed-control plugged in incorrectly	Plug speed-control in Ch 2
	Overload protection activated	Allow speed-control to cool down
	Wiring problem	Check wires and connectors
	Sensor Wire missing/defective	Install/replace sensor wire
	Motor defective	Replace motor
	Speed-control defective	Send in product for repair
No servo and no motor function.	Speedo connected to receiver with wrong polarity	Connect speedo with correct polarity
	Wiring problem	Check wires and connectors
	Battery defective	Replace with different battery pack
	Crystal defective	Replace components one by one.
	Receiver defective	
	Transmitter defective	
Motor stutters while accelerating	Speed-control defective	Send in product for repair
	Sensor Wire defective	Replace Sensor Wire
	Motor or Sensor Board in motor defective	Replace sensor board or motor
	Radio interference	Change location of components
	Power Capacitor damaged	Replace Power Capacitor
	Speed-control defective	Send in product for repair
Motor runs in reverse when accelerating forward on the transmitter.	Model with reversed gearbox!	Can not use a sensored brushless system!
Insufficient performance. E.g. poor brake power, topspeed or acceleration..	Motor pinion too big or gear ratio too long.	Use smaller motor pinion/shorter gear ratio
	Transmitter settings changed after set-up	Repeat set-up procedure
	Power Capacitor damaged	Replace Power Capacitor
	Motor or sensor-board in motor defective	Replace sensor-board or motor
	Speed-control defective.	Send in product for repair
Speed-control switches off frequently.	Running in LiPo mode when using NiMH battery!	Change value of Autocell System to #2
	Fan not connected or damaged	Check/attach fan
	Model used too often without cool-down periods	Let speed-control cool down after every run
	Motor stronger than motorlimit or input voltage too high	Use only motors and batteries which are within the specifications of the speed-control
	Motor pinion too big (e.g. gear ratio too long)	Use smaller motor pinion/shorter gear ratio
	Stuck drivetrain or ball-bearing	Maintain model
Motor never stops, runs at constant slow speed	Motor defective	Replace motor
	Transmitter settings changed after set-up	Repeat set-up procedure
	Humidity/water in speed-control	Immediately unplug and dry speed-control
	Motor or Sensor Board in motor defective	Replace sensor board or motor
Radio interference	Receiver or antenna too close to power wires, motor, battery or speed-control.	See „Installation Tips“ and „Installation“
	Receiver aerial too short or coiled up	
	Receiver defective, too sensitive; Transmitter defective, transmitter output power too low, servo problem	Replace components one by one Only use original manufacturers crystals
	Poor battery connection	Check plugs and connecting wires
	Transmitter batteries empty	Replace / recharge transmitter batteries

8. SPECIAL FEATURES

XPS.3 Power Profiles: results in more power and better driveability. Depending on the status of the car (start, acceleration, full speed) the software calculates the perfect motor management by adjusting current limiter, motor timing, throttle curve and more! Higher value means more overall power and aggressive response.

Caution: Do not run lowest mechanical timing setting on the motor when using high (>4) XPS.3 profiles!

Team advise: these are the NOSRAM factorydrivers preferred profiles for each racing class, which they vary slightly depending on track, used motor and personal preference!

CLASS	Touring Car	2wd Off-Road	4wd Off-Road	Truck Off-Road	1/12 th
XPS.3 Profile	4 - 6	1 - 3	2 - 4	2 - 4	2 - 5

Full Contact Cooling: another first, achieved by NOSRAM! The revolutionary Full Contact Cooling Technology for lowest running temperatures, a special copper core bonds the bottom side fet's to the heatsink for even cooling of all fet's which results in higher power towards the end of the run and a lower motorlimit.

Pure Brushless Forward/Brake Design: uncompromising and outstanding performance for top level competition was the target for the **Pearl!** Therefore the NOSRAM engineering team developed a pure forward/brake brushless competition speed-control. There is no reverse function and no brushed operation.

Smart-Temp-Readout System 2: allows you to read-out the maximum internal temperature that the speedo reached. You can conveniently read-out the temperature back in the pits since it remains stored until you turn it on the next time regularly (which will reset the memory). This new feature allows you to accurately check if all is running well or if you're close to shutdown already.

How to read-out the temperature:

- Switch at „OFF“ position.
- Keep MODE button pressed while you turn switch to „ON“ (then release button)
- SET LED will start to flash blue (MODE LED's are off), now count the number of flashes.
- The higher the number of flashes, the hotter the speedo ran, shutdown will occur at 10 flashes.
- Every flash below 10 equals to 5°C temperature decrease.

#1	#2	#3	#4	#5	#6	#7	#8	#9	#10
> -45°C	-40°C	-35°C	-30°C	-25°C	-20°C	-15°C	-10°C	-5°C	Shut-down
> -81°F	-72°F	-63°F	-54°F	-45°F	-36°F	-27°F	-18°F	-9°F	

SmartCell System: Ready for the next battery technology – LiPo batteries! NOSRAM's exclusive and SmartCell System ensures that LiPo batteries can be used safely without accidentally deep-discharging of the cells. The motor function will be shut-off and the SET LED will flash if the system recognises very low battery voltage.

Caution: the factory default is #1, which is „LiPo mode“! Make sure you change to #2 when running NiMH batteries with 4 or 5 cells.

All New Brake Design: the best got perfected further! A superlinear feeling with an even stronger pushbrake and 10 fine steps for almost infinite adjustments of initial- and autobrake!

Team advise: A good starting point for the brake setting on your radio is 80% for all classes. Make sure you do the radio-setup with all settings on the radio on 100%!

Changing Mode settings without the transmitter: At race events you usually do not have access to your transmitter, but never mind since you can simply disconnect the receiver lead from the receiver and change the MODE settings as described in section 6 „Mode Programming“.

Launch Control: the launch control allows „rocket like“ starts. After activation it gives you more power one time for the start (this feature is only recommended to be used with touring cars on high traction surfaces!).

How to activate launch control:

- Hold trigger on radio at full brake for 5sec before start. Ready and active!!!

Works-Default-Settings: All NOSRAM speed-controls come factory-adjusted (defaults are grey-shaded above). If you loose track of the modes, you can restore the works default settings. With the transmitter switched on, hold the SET button pressed while you switch on the speed-control. This returns the unit to the NOSRAM works default settings.

Power Capacitor: Never disconnect the power-capacitor! It offers increased punch and additional protection, it must be connected to BAT+ and BAT- solderpads with shortest possible wires.

FreezeDrive Design: NOSRAM's secret FreezeDrive Design results in lower speedo temperature under all racing conditions. Sorry, no further details to be disclosed. Simply a step ahead of the competition!

Sensored Brushless Technology: Enhanced Digital allows the perfect knowledge of the brushless motor's magnet position. This results in perfect motor control at high and low RPM's, as well as perfect brake control.

3-Way-Protection-System: The perfect protection against short-circuits (motor), overload and overheating. If your speed-control faces overload, the motor function will be shut-off for protection and the SET LED will flash, although the steering function is maintained. Let the speed-control cool down for a few minutes. If you experience frequent shutdowns, check for the following:

- Setting for SmartCell System (by mistake in LiPo mode when using NiMH batteries?)
- Correct gear ratio (refer to motor manual for gearing recommendations)
- XPS.3 setting too high (higher value will heat up motor and speed-control excessively)
- Motor is too strong or motor is damaged.

REPAIR PROCEDURES / LIMITED WARRANTY

All products from NOSRAM are manufactured according to the highest quality standards. NOSRAM guarantees this product to be free from defects in materials or workmanship for 90 days (non-european countris only) from the original date of purchase verified by sales receipt. This limited warranty doesn't cover defects, which are a result of misuse, improper maintenance, outside interference or mechanical damage.

„This applies among other things on:

- Cut off original power plug or not using reverse polarity protected plugs
- Receiver wire and/or switch wire damaged
- Mechanical damage of the case
- Humidity/Water inside the speed control
- Mechanical damage of electronic components/PCB
- Soldered on the PCB (except on solderpads)
- Connected speed-control with reversed polarity“

To eliminate all other possibilities or improper handling, first check all other components in your model and the trouble shooting guide, if available, before you send in this product for repair. If products are sent in for repair, which do operate perfectly, we have to charge a service fee according to our pricelist.

With sending in this product, the customer has to advise NOSRAM if the product should be repaired in either case. If there is neither a warranty nor guarantee claim, the inspection of the product and the repairs, if necessary, in either case will be charged with a fee at the customers expense according to our price list. A proof of purchase including date of purchase needs to be included. Otherwise, no warranty can be granted. For quick repair- and return service, add your address and detailed description of the malfunction.

If NOSRAM no longer manufactures a returned defective product and we are unable to service it, we shall provide you with a product that has at least the same value from one of the successor series.

The specifications like weight, size and others should be seen as guide values. Due to ongoing technical improvements, which are done in the interest of the product, NOSRAM does not take any responsibility for the accuracy of these specs.

NOSRAM-Distributor-Service:

- Package your product carefully and include sales receipt and detailed description of malfunction.
- Send parcel to your national NOSRAM distributor.
- Distributor repairs or exchanges the product.
- Shipment back to you usually by COD (cash on delivery), but this is subject to your national NOSRAM distributor's general policy.



The crossed-out wheeled bin means that within the European Union the product must be taken to separate collection at the product end-of-life. Do not dispose of these products as unsorted municipal waste.